

PERIODONTAL DISEASE AND PREGNANCY

OUTCOME: A CORRELATIVE STUDY

**PUROBI CHOUDHURY¹, CHANDAN KUMAR DAS²,
SWARGA JYOTI DAS³ & GOKUL CHANDRA DAS⁴**

¹Department of Dentistry, Silchar Medical College and Hospital, Silchar, Assam, India

²Grade II Tripura Dental Service I/ C Head of the Department, Department of Dentistry,
Indira Gandhi Memorial Hospital, Agartala, Tripura, India

^{1,2}Department of Periodontics and Implantology, Regional Dental College, Guwahati, Assam, India

³Professor & Head, Department of Periodontics and Implantology, Regional Dental College, Guwahati, Assam, India

⁴Department of Obstetrics & Gynecology, Guwahati Medical College and Hospital, Guwahati, Assam, India

ABSTRACT

The relationship between periodontal diseases and pregnancy outcome in terms of pre term low birth weight has been widely investigated, though observation till today is controversial. Considering this, the present study was conducted to determine the relationship of periodontal health and pregnancy outcome. 300 pregnant women without systemic diseases or the risk factors for this were chosen. It includes Term Labor, considered as control (labor at ≥ 37 weeks; $n=225$) and Preterm Labor, considered as case (labor at ≤ 37 weeks; $n=75$). Gingival and calculus indices and probing pocket depth were recorded in the mothers of both groups. Similarly, birth weight of all the new born was recorded. Significant differences in gingival index and birth weight were observed in between the case and control group, though not of calculus and probing pocket depth. From the findings of present study, we may conclude that poor gingival health definitely affects the pregnancy outcome.

KEYWORDS: periodontal Disease, Calculus, Pregnancy, Term Labor, Preterm Labor & Low Birth Weight

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INTRODUCTION

Periodontal disease is an inflammatory disease, caused predominantly by Gram-negative, anaerobic, and microaerophilic bacteria that colonise the subgingival area, but the disease expression is affected and modified by environment, physical, social and host stresses. It results in progressive destruction of the periodontal ligament and alveolar bone with increased probing depth, recession, or both (Newman *et al.*, 2011). An association has been established between severe periodontitis and a variety of systemic conditions (Fowler *et al.*, 2001). Galloway (1931), first suggested that periodontal disease may provide sufficient infectious microbial challenge to have potentially harmful effects on the pregnant mother and developing foetus. Mothers with periodontal disease have about 7 to 8- fold greater chance of having preterm low birth weight (gestational age ≤ 37 weeks) babies than do mothers without periodontal disease (Offenbach *ret al.*, 1996; Jeffcoat *et al.*, 2001).

In a normal pregnancy, maternal hormones and locally acting cytokines play a key role in regulating the onset of labor, cervical ripening, uterine contraction and delivery (Offenbach *ret al.*, 1998). Prostaglandin (PGE) 2 production in the amnion increases gradually throughout the gestational period, and labor is triggered once the

level of PGE2 reaches a certain threshold. The main cause of low birth weight deliveries is premature rupture of membrane and preterm delivery (Pallasch and Wahl, 2000). The pathological mechanism by which chronic periodontitis may result in premature termination of a pregnancy remains unclear. Maternal periodontal infection may cause increased PGE2 production, and labor-inducing levels being achieved before full gestation. Furthermore, Gram-negative bacteria, lip polysaccharide (LPS) and other soluble bacterial components from the periodontal disease have ready access to the circulation, which may then become a potential threat to the foetal-placental unit. Moreover, LPS may activate placental release of TNF- α and IL (1 and 6), which subsequently, induces systemic as well as placental inflammatory response resulting in premature rupture of membrane and preterm delivery (Li *et al.*, 2000) (Figure 1).

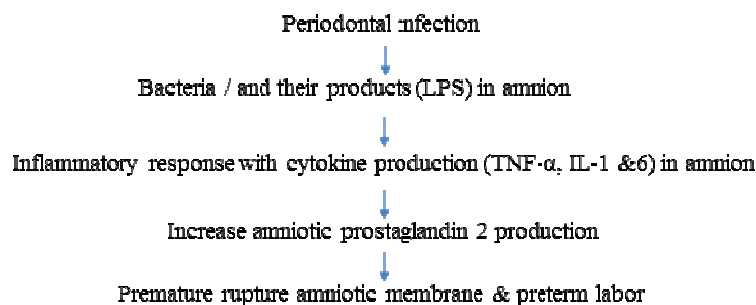


Figure 1: Probable Mechanism of Preterm Labor Induced by Periodontal Disease

The relationship between periodontal diseases and pregnancy outcome in terms of pre term low birth weight has been widely investigated, though observation till today is controversial. Considering this, the present study was conducted to determine the relationship of periodontal health and pregnancy outcome.

MATERIALS AND METHODS

This study was carried out in the Department of Obstetrics & Gynaecology, Gauhati Medical College & Hospital, Guwahati, to determine the association of maternal periodontal health and outcome of pregnancy in terms of birth weight of new born baby. A total of 300 systemically healthy mothers, comprising of mothers who delivered before 37 weeks of gestation and the weights of the new born babies were less than 2.5 Kg (assigned as preterm low birth weight group, considered as case; n= 75) and mothers, who delivered after 37 weeks of gestation and weight of the new born babies were more than 2.5 Kg (assigned as full term normal birth weight, considered as control; n= 225). The weight of the babies was recorded using Baby Weighing Scales (pan type) with plastic pan. The following inclusion and exclusion criteria were considered:

Inclusion Criteria

- Age group between 18-30 years
- Primiparous mothers, who had spontaneous delivery of one child per partum
- Mothers, who were free from systemic disease
- Patients, who had not received any type of periodontal therapy during the last 12 months

Exclusion Criteria

- Mothers, with the history of medications or medical problems such as use of systemic corticosteroids, antibiotics,

congenital heart disease existing hypertension, pre-pregnant diabetes, asthma and chronic renal diseases

- Mothers, with multiple deliveries as well as paired pregnancies
- The number of teeth in the dentition less than 18.

Clinical Parameters

The following clinical parameters were recorded within 24 hours of delivery, using UNC-15 periodontal probe:

Gingival index

Calculus index

Probing Pocket Depth

Birth weight of new born babies

Recordings were carried out in ten teeth of the dentition, regarded as index teeth, considering them as the best estimators of the worst periodontal condition of the mouth. They were 11, 16, 17, 26, 27, 31, 36, 37, 46 and 47.

Gingival Index (Loe, 1967):

The Scoring Criteria is as follows

- **Score 0:** Absence of inflammation / normal gingival
- **Score 1:** Mild inflammation; slight change in color and slight edema; no bleeding on probing.
- **Score 2:** Moderate inflammation, redness, edema and glazing, bleeding on probing.
- **Score 3:** Severe inflammation, marked redness and edema, ulceration, tendency to spontaneous bleeding.

The scores around each tooth were totaled and divided by four to obtain gingival index score for the tooth. The gingival score for a subject was obtained by adding the score of each tooth divided by the number of teeth examined. The gingival health was categorized on the basis of scores obtained and evaluated as follows:

Mild gingivitis	-	0.1 – 1.0
Moderate gingivitis	-	1.1 – 2.0
Severe gingivitis	-	2.1 – 3.0

Calculus Index (Greene and Vermillion, 1964):

Scoring Criteria of Calculus is as Follows:

- **Score 0:** No calculus present
- **Score 1:** Supragingival calculus covering not more than cervical third of the exposed tooth surface.
- **Score 2:** Supragingival calculus covering more than one third, but not more than two third of the exposed tooth surface or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth or both.
- **Score 3:** Supragingival calculus covering more than two third of the exposed tooth surface or a continuous heavy

band of sub gingival calculus around the cervical portion of the tooth or both.

After scoring, the scores were totaled and divided by the number of tooth surfaces scored. Based on the scores, the oral hygiene was rated as good, fair and poor.

Good - 0.0 - 0.6

Fair - 0.7 - 1.8

Poor - 1.9 - 3.0

Probing Pocket Depth

Probing pocket depth was measured using calibrated UNC-15 periodontal probe. It is a 15 mm long probe with millimeter marking at each millimeter and color coding at 5th, 10th and 15th millimeter. It is used to measure the depth of the pocket and to determine their configurations. When measuring a pocket, probe is inserted with a firm, gentle pressure (0.75 N) to the bottom of the pocket. The shank should be aligned with the long axis of the tooth surface to be probed. Each tooth was examined at four sites, namely mid-buccal, mesio-buccal, disto-buccal and mid-lingual.

RESULTS & OBSERVATIONS

The Study was conducted to determine the relationship of periodontal health and pregnancy outcome.

Gingival Index

The mean gingival score in the control group was found to be 1.1 ± 0.4 , ranging from 0.7 to 1.6, while in the case group it was found to be 1.2 ± 0.3 , and ranges being 0.8 to 2.0. The difference in the gingival index in between the case and control group was found to be statistically significant ($p < 0.05$), as shown in Table 1.

Calculus Index

As shown in Table 1, the mean calculus score in the control group was 1.1 ± 0.7 , ranging from 0.6 to 1.7. The average calculus index in the case group was found to be 1.0 ± 0.3 , ranging from 0.7 to 2.3. The differences in the calculus score in between the case and control group was found to be not statistically significant ($p > 0.05$).

Table 1: Mean \pm SEM of Gingival & Calculus Scores, Probing Pocket Depth and Weights of New Born Babies in Control and Case Groups (Ranges are Shown in Bracket)

Parameters	Control (N =225)	Case (N = 75)	P Value
Gingival index	1.1 ± 0.4 (0.7 - 1.6)	1.2 ± 0.3 (0.8 - 2.0)	$p < 0.05^*$
Calculus index	1.1 ± 0.7 (0.7 - 2.3)	1.0 ± 0.3 (0.7 - 2.3)	$p > 0.05^{ns}$
Probing Pocket Depth	2.7 ± 0.6 (2.1 - 3.5)	2.7 ± 0.6 (2.3 - 4.7)	$p > 0.05^{ns}$
Birth weight (Kg)	3.14 ± 0.44 (2.6-4.0)	2.14 ± 0.32 (1.2 -2.4)	$p > 0.05^{5ns}$

*Statistically significant; ns= not significant

Probing Pocket Depth

As shown in Table 1, the mean probing pocket depth in the control and case groups was found to be 2.7 ± 0.5 . As such, no difference was observed in between.

Birth Weight of New Born Babies:

The mean weight of babies born to the mothers of the control group was found to be 3.14 ± 0.44 , ranging from 2.6 to 4.0, while in the case group it was found to be 2.14 ± 0.32 , ranges being 1.2 to 2.4 Kg. The difference in the weight of the babies born to mothers belongs to the control and case group was 1.0 Kg. However, the difference is not statistically significant ($p < 0.05$), as shown in Table 1.

DISCUSSIONS

Preterm birth itself is associated with one or more health complications in majority of the newborns. It is well established that preterm birth necessitates an expensive postnatal care for the management of birth defects and other diseases common in children who are born preterm (Tanner *et al*, 2005). Vaginal infection is described as the cause for preterm gestation (Gravett *et al*, 1986). Bacterial infection, such as periodontal infection with a chronic persistent production of toxins and metabolites could therefore be considered as instrumental in inducing an inflammatory process in the placenta. Moreover, studies have shown that 4 organisms are associated with progressing periodontitis, namely *Bacteroidforsythus*, *Porphyromonasgingivalis*, *Actinobacillusactinomycetemcomitans* and *Treponema denticola* were detected at higher levels in preterm low birth weight mothers as compared to the mother of normal birth weight babies (Offenbach *et al*, 1998).

The findings of the present study showed that the average weight of the babies born to the mothers belong to the case group is 2.14 ± 0.32 Kg, whereas the weight of the babies born to the mothers belong to the control group was 3.14 ± 0.44 . This may indicate a significant relationship between gingival health and duration of pregnancy, and consequently periodontal disease could be a risk factor for preterm labor, as suggested by ZadehModarres *et al* (2007).

It is proposed in various studies that preterm low birth weight occurs due to presence of maternal infections (Gibbs *et al*, 1992). The effects of periodontal disease on the outcome of pregnancy was first investigated by Offenbach *et al* (1996), in case-control manner involving 93 mothers, to whom preterm low birth weight infants were born and observed a positive association of the two. On the contrary, Davenport *et al* (2002) failed to find a positive correlation between periodontal disease and pregnancy outcome in a case-control study, conducted on 743 mothers. Our findings support the observation of Offenbach *et al* (1996). The differences observed in our study from Davenport *et al* (2002), perhaps, may be due to differences in study design and defining both thresholds of periodontal disease and adverse outcome.

As the present study is a case-control study, it does not distinguished between causes and associated factors. Moreover, it only estimates the relative risk, not the incidence, and selection of appropriate control group may also be difficult (Soben, 2011). These potential bias do not exist in the prospective studies, therefore, further research in this area is required, particularly with respect to the effect of population differences on this potential association between periodontal disease and preterm low birth weight. Moreover, whether the relationship between periodontal disease and preterm low birth weight is caused or simply associative needs to be better clarified.

CONCLUSIONS

Within limits of this clinical study, we may conclude that poor periodontal health affects the pregnancy outcome in terms of pre term low birth weight babies.

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